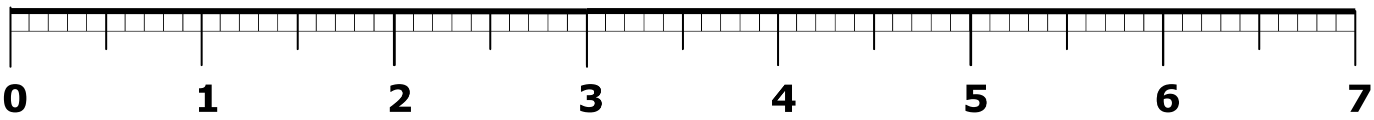
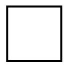
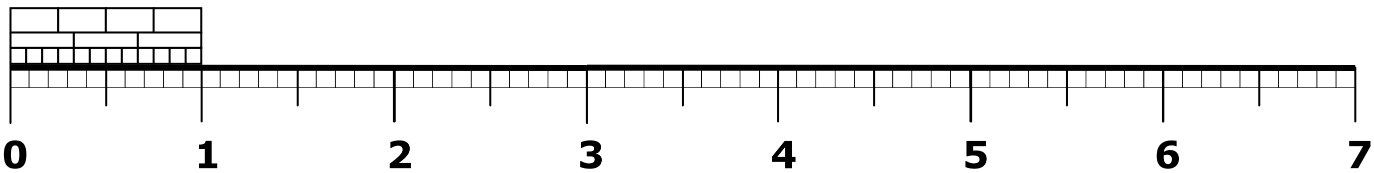
Fussing with Fractions: Number Lines

I thought I ought to be able to use my number line www.soesd.k12.or.us/files/building_roots_2.doc

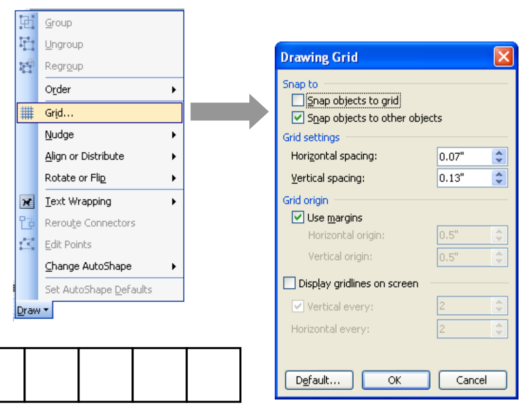


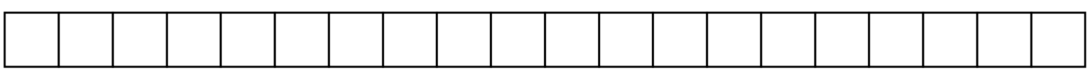
and a bunch of squares of any size 

to make a number line that was neatly divisible into fractions, like this one where the first unit is divided into fourths, thirds, twelfths, and tenths:



I got the number line by opening it from the url above, right-clicking on it, copying it, and pasting it into my Word document. Then I drew a square by clicking on the rectangle drawing tool and holding the shift key down, forcing the rectangle's height and width to be equal. After I had my square—I didn't worry about the dimensions since I was going to resize them anyway to fit into the units on my number line—I made sure the Grid settings in Word were "Snap objects to other objects". Then I could make a long line of neatly lined-up squares:

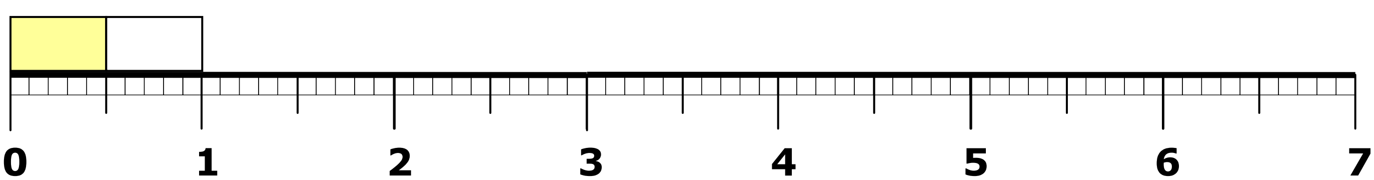




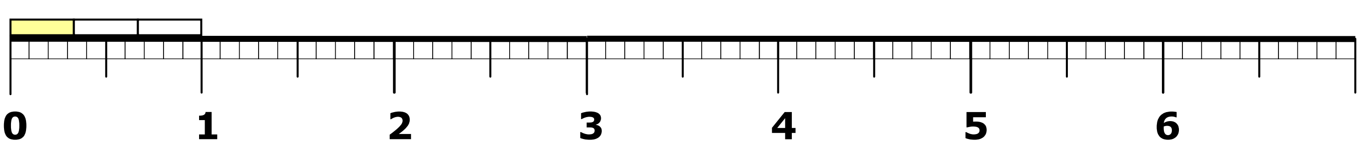
My idea was that I could grab a string of n of these and resize them to mark off n-ths on my number line.

I figured I'd make my first computation be $\frac{1}{2} + \frac{1}{3}$

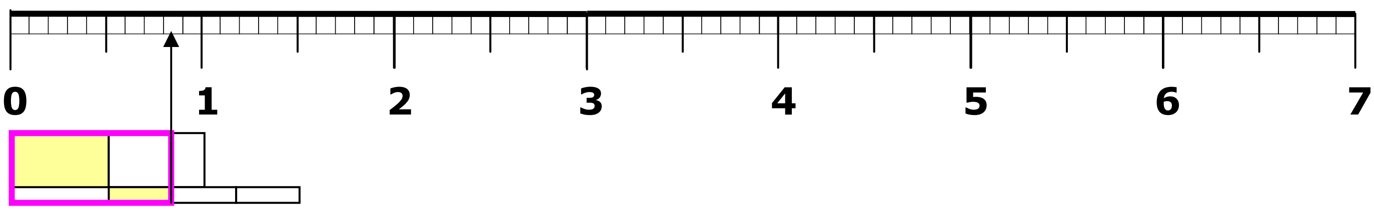
So I copied two squares with control+shift+drag, grouped 'em, and stretched 'em into rectangles that fit between 0 and 1 on my number line. Then I filled one of the rectangles in since I only had $\frac{1}{2}$.



Then I copied three squares and stretched and so forth to get $\frac{1}{3}$:



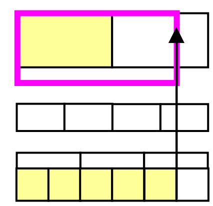
Since adding means joining, I started the $\frac{1}{3}$ where the $\frac{1}{2}$ left off:



The length $\frac{1}{2} + \frac{1}{3}$ turns out to be a little less than 1 and a little more than $\frac{8}{10}$.
(This should not be a surprise.)

But how should we express this less-than-1 length as a fraction? (And what would be our logical reasoning?)

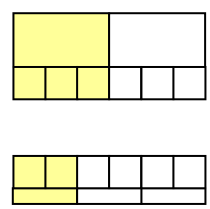
If we divide the $\frac{2}{2}$ in halves again, we get $\frac{3}{4}$, which isn't long enough, or $\frac{4}{4}$, which is too long



But if we divide each of the $\frac{3}{3}$ in halves, we get $\frac{6}{6}$,

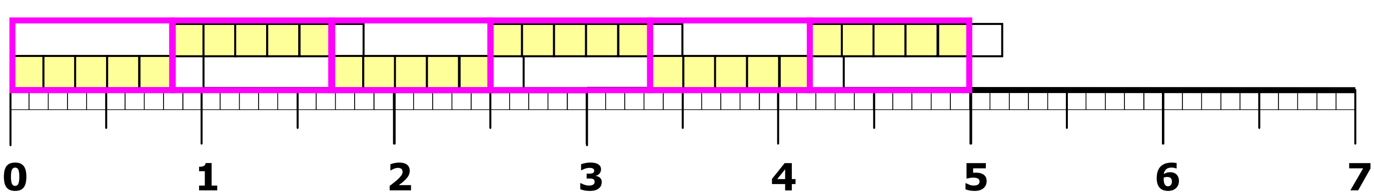
$\frac{5}{6}$ appears to be just right: it seems to cover the $\frac{1}{2} + \frac{1}{3}$ length exactly!

In fact, you can even see how the pieces match:



$\frac{1}{2} = \frac{3}{6}$ and $\frac{1}{3} = \frac{2}{6}$, so $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$

It's also interesting to note that 6 of those $\frac{5}{6}$ pieces make 5 inches:



Why do you think *that* is?

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